1.8 – Graph Rational Functions

Graph a Rational Function

Once we have established our domain, asymptotes, and intercepts of a rational function, we can begin to sketch its graph.

All that's left is to:

1. establish the intervals of the domain of the function (include the intervals between x-int.)
2. pick x-values within each interval of the domain
3. plug the selected x-values into the function to get y-values
4. plot the points
5. connect the points with smooth curves (remember that graphs cannot cross asymptotes)

Example 1 1st - factor

$$f(x) = \frac{3x^2 - 3}{x^2 - 9} = \frac{3(x^2-1)(x+1)}{(x+3)(x-3)}$$

Domain: $\{x \mid x \neq \pm 3, x \in \mathbb{R}\}$

V_{asy}: $x+3=0$, $x-3=0$ $\boxed{x = \pm 3}$

H_{asy}: $\frac{n=2}{m=2}$ $n=m$ $y = \frac{3}{1} = \boxed{3}$

x-int: $x-1=0$, $x+1=0$ $\boxed{x = \pm 1}$

y-int: $x=0$ $y = \frac{3(0)^2-3}{(0)^2-9} = \frac{-3}{-9} = \boxed{\frac{1}{3}}$

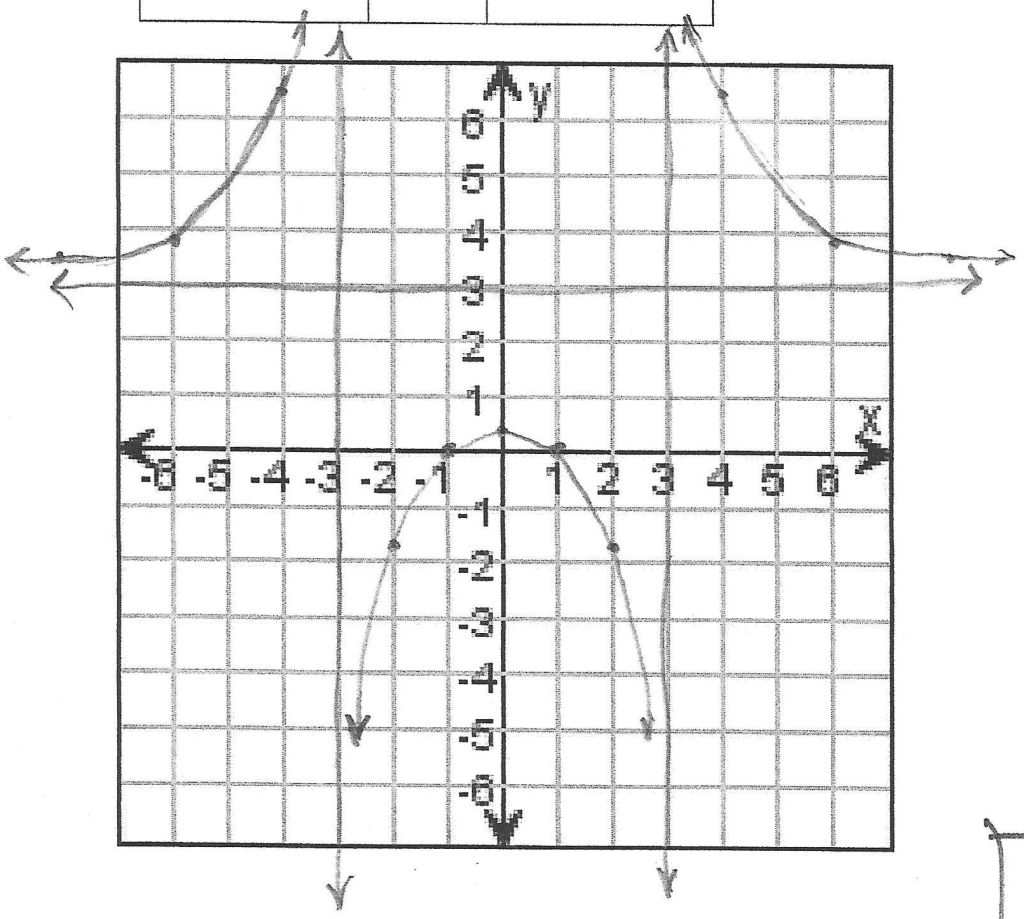
Domain Intervals: $(-\infty, -3)(-3, -1)(-1, 1)(1, 3)(3, \infty)$

~~Points:~~

Points:

Interval	x-value	y-value
$-\infty, -3$	-8	$\frac{189}{55} = 3.4$
	-6	$\frac{105}{27} = 3.9$
	-4	$\frac{45}{7} = 6.4$
$-3, -1$	-2	$\frac{9}{-5} = -1.8$
$-1, 1$	0	$\frac{1}{3}$
$1, 3$	2	-1.8
$3, \infty$	4	6.4
	6	3.9
	8	3.4

$$\frac{3x^2 - 3}{x^2 - 9}$$



Graph

HW: $f(x) = \frac{5x^2 - 5}{x^2 - 4}$